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Study of the effect of the deposition method on the spectral properties of luminescent PMMA films doped with Eu^{3+} complexes with amoxicillin ligand.

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In order to study the effect of variations in the film production method, the synthesis of a new Eu^{3+} complex was carried out using the β-diketone 2-thenoyltrifluoroacetone (HTTA) and the ligand amoxicillin , (2S,5R,6R)-6-[[(2R)-2-amino-2-(4-hydroxyphenyl)acetyl]amino]-3,3-dimethyl-7-oxo-4-thia-1-azabicyclo[3.2.0]heptane-2-carboxylic acid (AMX) and the production of photoluminescent films of PMMA, with individual doping of the complexes $[Eu(TTA)_3(H_2O)_2]$ and $[Eu(TTA)_3(AMX)]$ at concentrations of 0.5%, 1.0%, 2.0% and 5.0 % (m/m) by spin coating and casting deposition methods. The analytical and spectroscopic data justify the composition and stoichiometric proportion suggested for the new synthesized complex. In the infrared, the shift of the C=O stretching bands to 1604cm^{-1} and C=C of enol to 1535cm^{-1}, and the absence of stretching bands of C=O of the β-lactam ring and C=O of amide suggest coordination of 2-thenoyltrifluoroacetone and amoxicillin through the bidentate mode, according to the ground state structure generated by the semi-empirical quantum model RM1, which allowed the study of theoretical spectral parameters and energy transfer processes based on multipolar and exchange mechanisms. Regarding the films, they all presented a transparent appearance under natural lighting (>90%) and intense red emission under UV excitation, in addition to the morphological and topographic properties that were studied. Finally, the optical properties were analyzed based on the excitation and emission spectra, with emphasis on the characteristic transitions of the Eu^{3+} ion, $^5D_0 \rightarrow {}^7F_J$ (J= 0-4). Emission lifetime data were also determined, allowing calculation of Judd-Ofelt intensity parameters, radiative and non-radiative decay rates, intrinsic quantum yield, asymmetry parameter, chromaticity coordinates and color temperature. The luminescent properties of the materials point to optoelectronic, security and photovoltaic applications, as well as a range of other possibilities.

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